LWG
LOWER WILLAMETTE GROUP

PORTLAND HARBOR SUPERFUND SITE ECOLOGICAL RISK ASSESSMENT:

PROCESS FOR SELECTING ACUTE AND CHRONIC WATER SCREENING LEVELS FOR PORTLAND HARBOR SURFACE WATER, GROUNDWATER, AND TRANSITION ZONE WATER

DRAFT

April 29, 2005

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This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

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LIST OF ACRONYMS

ACG	analytic concentration goal
AhR	aromatic hydrocarbon receptor
AWQC	Ambient Water Quality Criteria
BERA	Baseline Ecological Risk Assessment
BSAF	biota-sediment accumulation factor
bw	body weight
CAS	Chemical Abstracts Service
COI	chemical of interest
CWA	Clean Water Act
EPA	US Environmental Protection Agency
ERA	ecological risk assessment
LCV	lowest chronic value
LOEC	lowest-observed-effect-concentrations
NOEC	no-observed-effect-concentrations
ODEQ	Oregon Department of Environmental Quality
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
TEF	toxic equivalence factor
TEQ	toxicity equivalence
VOC	volatile organic compound
WHO	World Health Organization

1.0 INTRODUCTION

The overall Ecological Risk Assessment (ERA) Approach was outlined in the *Portland Harbor Remedial Investigation/ Feasibility Study Programmatic Work Plan* (Integral et al. 2004), and was approved by the US Environmental Protection Agency (EPA) in June 2004. This technical memorandum has been prepared at the request of EPA to present the process of selecting acute and chronic water screening levels (SLs) for use in preliminary ecological evaluation of Round 2 data relating to surface water, groundwater, and transition zone water (in the biologically active zone, 0-1 ft) from Portland Harbor. Receptors of concern include aquatic organisms and amphibians. The results of preliminary ecological screening of water will be presented initially in the ecological risk evaluation in the Round 2 Comprehensive Site Characterization and Data Gaps Evaluation Report and later in the Baseline Ecological Risk Assessment (BERA). Water SLs provide a threshold value below which adverse effects on aquatic life are not expected. The list of SLs will be updated iteratively as more data become available. These preliminary SLs will be used to help narrow the list of chemicals that will be evaluated in detail in the BERA.

Screening for preliminary evaluation of Round 2 surface water, transition zone water, and groundwater, which will be presented in the ecological risk evaluation in the Round 2 Comprehensive Site Characterization and Data Gaps Evaluation Report, will involve two steps. First, all detected chemicals will be compared to SLs developed according to the process described in this memorandum. The list of SLs will be updated iteratively to include chemicals detected in future water analyses. Second, the detection limits of all non-detected chemicals will be compared to their ecologically derived analytic concentration goals (ACGs) as described in *Portland Harbor RI/FS Round 2 Quality Assurance Project Plan Addendum 1: Surface Water* (Integral 2004c). This two-step process will allow preliminary screening of detected chemicals, as well as an assessment of the adequacy of specific chemical analytical methods to address ecological risk questions.

The SLs developed according to the process laid out in this document will have several applications. One objective of their use is as a line of evidence for identification of contaminants of potential concern (COPCs) for fish and invertebrates in contact with surface water (fish and invertebrates) and transition zone water (invertebrates). The screening of surface water will also help identify COPCs for amphibians in the amphibian exposure areas identified in the Programmatic Work Plan. Screening of nearshore upland groundwater data will help identify site-specific upland groundwater constituents that will be considered in the Round 2 Groundwater Pathway Assessment and in the ecological risk evaluation in the Round 2 Comprehensive Site Characterization and Data Gaps Evaluation Report. A final objective of future screening is to identify data gaps for transition zone water sampling and analysis. SLs are not remediation goals or standards and are not intended to be used as such.

2.0 SELECTION OF WATER SCREENING LEVELS

This section presents the process for identifying chemicals of interest (COIs),[1] the literature sources from which water level SLs will be developed, and the hierarchic ordering in which these sources will be considered in developing SLs.

2.1 IDENTIFICATION OF CHEMICALS OF INTEREST

The COIs identified for development of SLs include chemicals detected in the *Upland Groundwater Data Review Report* (GSI 2003) and/or chemicals detected in Round 2 surface water (Integral 2004a), groundwater (Integral 2004b), or transition zone water (peeper) (Integral 2004b) samples. At this time, Round 2A data have not been validated, and data from future sampling events are anticipated. The COI list will be updated as existing data are validated and additional data for groundwater, surface water, and transition zone water become available.

2.2 SOURCES OF SCREENING LEVELS, CRITERIA, AND TOXICITY VALUES

Federal and state regulations and guidance offer several sources for developing SLs for water. Existing sources for developing SLs are described briefly in this section.

2.2.1 Ambient Water Quality Criteria

EPA provides Ambient Water Quality Criteria (AWQC) in accordance with the Clean Water Act (CWA). AWQC for 158 pollutants were updated in 2002 (EPA 2002b). These criteria are based on data and scientific judgment addressing the relationship between chemical concentrations and environmental and human health effects. AWQC for aquatic life are intended to be protective of 95% of aquatic species (Stephan et al. 1985). The SLs developed by the process set forth in this memorandum will consider only freshwater acute and chronic AWQC based on toxicity endpoints (i.e., effects-based criteria).

The pH and hardness of water affect the bioavailability, and therefore the toxicity of some chemicals. The AWQC for pentachlorophenol and ammonia are identified as pH-dependent. Cadmium, chromium III, copper, lead, nickel, silver, and zinc have hardness-dependent AQWC. For chemicals with hardness- and pH-dependent AWQC, equations are provided by EPA to adjust them to site-specific hardness and/or pH levels (2002b).

2.2.2 Oregon Water Quality Criteria

In 2004, the Oregon Environmental Quality Commission adopted new water quality criteria (ODEQ 2004), effective February 15, 2005, based almost entirely on the

[1] A COI is defined as any detected chemical.

federal AWQC (EPA 2002b). The criteria have not yet been approved by EPA for federal Clean Water Act purposes. The new Oregon water quality criteria consist of criteria for most metals and several organic compounds (mostly pesticides), plus guidance values for many other organic compounds with insufficient data for developing criteria. Criteria based on effects-based endpoints will be considered for development of SLs.

2.2.3 Oak Ridge National Laboratory Toxicological Benchmarks

Suter and Tsao (1996) calculated and compiled secondary acute and chronic values for chemicals with some toxicity data, but not enough to meet the data requirements for development of AWQC (EPA 2002b). Toxicity data used for these Tier II value calculations have the same data quality requirements as those used to calculate AWQC, but lack the number of studies required for developing AWQC, which requires studies of acute toxicity on at least eight specified families of aquatic organisms. Most of the secondary values calculated by Suter and Tsao (1996) were adopted by the Oregon Department of Environmental Quality (ODEQ) as Level II screening values for ecological risk assessments (ODEQ 2001).

Suter and Tsao (1996) also compiled Lowest Chronic Values (LCVs) for several specific groups of organisms (fish, daphnids, non-daphnid invertebrates, and aquatic plants). These values are used to calculate federal chronic AWQC, and Tier II values for those compounds with insufficient data to calculate AWQC. They refer to the lowest (most protective) chronic toxicity value among all similar values for organisms within that group. Chronic values for multiple species must be available to calculate a Tier II value.

2.2.4 ECOTOX Database

The ECOTOX database provides a tool for developing SLs when other criteria are not available. The ECOTOX database, which was developed and is maintained by EPA (2002a), consists of toxicity values for aquatic and terrestrial organisms (plants and animals) taken from the scientific literature. ECOTOX allows users to query the database and reports the species tested, the endpoint and effects assessed, the duration and type of exposure, effect and no-effect concentrations, and the reference for the original study. Both acute and chronic studies are included in the database, and endpoints include no-observed-effect-concentrations (NOECs), lowest-observed-effect-concentrations (LOECs), lethal concentrations to 50% or 100% of tested organisms (LC50s or LC100s), effects concentrations to 50% of organisms tested (EC50s), and other significant effects concentrations. When no criterion, screening level, or guidance (Sections 2.2.1 through 2.2.4) can be identified for a COI, that chemical will be queried in ECOTOX using its respective CAS (Chemical Abstracts Service) number. Searches will be limited to growth, mortality, or reproductive effects studies on freshwater organisms.

The most protective freshwater LC50 or EC50 in each query report will be selected as the acute value. To be as consistent as possible with the national recommended AWQC calculations (Stephan et al. 1985), the most protective acute value will be divided in half to determine the preliminary acute SL. Finally, preliminary chronic SLs will be calculated by dividing the preliminary acute SL by a safety factor of 10.

2.2.5 Other literature sources

Other literature sources search tools (e.g. BIOSIS) may be considered if no existing criterion, screening level, or guidance (Sections 2.2.1 through 2.2.4) can be identified, and if adequate studies are not found in ECOTOX. Literature searches will focus on identifying chronic and acute studies searches related to chemical effects on growth, mortality, or reproductive effects studies on freshwater organisms. The most protective freshwater LC50 or EC50 divided by 2 will be selected as the acute value, to be consistent with AWQC calculations (Stephan et al. 1985). Provisional chronic SLs will be calculated by dividing the selected preliminary acute SL by a safety factor of 10.

2.3 HIERARCHY OF SELECTION OF SCREENING LEVEL

A hierarchy was developed to prioritize available water criteria, screening levels, and toxicological data from the various sources presented in Section 2.2. Federal criteria come first in the hierarchy, followed by state criteria or screening levels, values from toxicity testing from the ECOTOX database (EPA 2002a), and then values from other literature searches. The selection processes for acute and chronic SLs are described in Sections 2.3.1 and 2.3.2, respectively.

2.3.1 Acute SLs

Acute SLs will be selected based on availability according to the following hierarchy:

1. Acute federal AWQC (EPA 2002b)
2. More protective of acute ODEQ guidance value (ODEQ 2004) or Tier II acute value from Suter and Tsao (1996)
3. Non bioaccumulation based chronic federal AWQC (EPA 2002b), multiplied by 10 (acute-to-chronic ratio of 10)
4. The more protective of chronic ODEQ guidance value (not based on bioaccumulation) or Tier II chronic value from Suter and Tsao (1996), multiplied by 10 (acute-to-chronic ratio of 10)
5. The most protective LCV published in Suter and Tsao (1996), multiplied by 10 (acute-to-chronic ratio of 10)
6. A reasonable surrogate for the chemical—either the same compound or a compound of similar structure—considered using the hierarchic steps above

7. The lowest relevant acute value (LC50 or EC50) from ECOTOX database (EPA 2002a) divided by a safety factor of 2
8. The lowest relevant LC50 or EC50 value for freshwater organisms found in a literature search (e.g. BIOSIS) divided by a safety factor of 2.

2.3.2 Chronic SLs

Chronic SL criteria will be selected based on availability according to the following hierarchy:

1. Chronic federal AWQC (EPA 2002b)(not based on bioaccumulation)
2. More protective of chronic ODEQ guidance value (ODEQ 2004)(not based on bioaccumulation) or Tier II chronic value from Suter and Tsao (1996)
3. Acute federal AWQC (EPA 2002b) divided by a safety factor of 10
4. The more protective of acute ODEQ guidance value (ODEQ 2004) or Tier II acute value from Suter and Tsao (1996) divided by a safety factor of 10
5. The most protective LCV published in Suter and Tsao (1996)
6. A reasonable surrogate for the chemical—either the same compound or a compound of similar structure—considered using the hierarchic steps above
7. The preliminary acute SL selected from ECOTOX database (EPA 2002a) divided by a safety factor of 10
8. The preliminary acute SL selected from a literature search. divided by a safety factor of 10

2.3.3 Additional Considerations for Selection of Acute and Chronic SLs

Using the hierarchy presented in sections 2.3.1 and 2.3.2, acute and chronic SLs will be developed for each COI. For many chemicals, existing federal or state criteria will be available. For some of the chemicals that have no existing federal or state criterion, SLs will be derived using toxicity data from the ECOTOX database or literature searches. The concentration range of each chemical will be compared to both chronic and acute values, and the comparisons discussed within the ecological context as part of the ecological risk evaluation in the Round 2 Comprehensive Site Characterization and Data Gaps Evaluation Report and the BERA.

Water quality criteria for some chemicals are dependent on the hardness or pH of the water (EPA 2002b). If SLs are required for any chemical with hardness- or pH-dependent criteria (AWQC only), the SLs will be adjusted to the hardness and/or pH

levels observed in the Lower Willamette River and associated groundwater, using the equations provided by EPA (2002b).

2.3.4 Selection of Amphibian-Specific Screening Levels

Many existing water quality guidance values do not include consideration of amphibians (EPA 2002b; ODEQ 2004; Suter and Tsao 1996). Separate water SL criteria will be developed for the risk evaluation of amphibian receptors. Acute and chronic amphibian-specific SLs will be developed for each COI detected in surface water.

Amphibian-specific acute SLs will be selected based on the following hierarchy:

1. Acute SL selected according to the hierarchy in Section 2.3.1 where amphibian data were used to develop AWQC, ODEQ, or Tier II values on which the selected SLs are based
2. The lowest relevant acute value (LC50 or EC50) from ECOTOX database (EPA 2002a) or derived from a literature search (e.g., BIOSIS) divided by a safety factor of 2

Amphibian-specific chronic SL criteria will be selected based on the following hierarchy:

1. Chronic SL selected according to the hierarchy in Section 2.3.2 where amphibian data were used to develop AWQC, ODEQ, or Tier II values on which the selected SLs are based
2. The preliminary amphibian acute SL selected from ECOTOX(EPA 2002a) database or literature search divided by a safety factor of 10

For COIs for which AWQC, ODEQ or Tier II values are available and have included consideration of data based on amphibian species, these values will be used as amphibian SLs. For all other chemicals, appropriate SLs will be derived using amphibian toxicity data from the ECOTOX database, literature searches, or data compilations (Schuytema and Nebeker 1996). In addition, references from the Reptile and Amphibian Toxicology Literature database may be considered (CWS 2003). Many of the selected amphibian-specific SLs will be based on the original review of literature, as much of the recent amphibian toxicity data have not yet been incorporated into federal and state agency criteria development.

The range of concentrations of surface water COIs will be compared to both chronic and acute amphibian-specific SLs, and the comparisons discussed in an ecological context as part of the ecological risk evaluation in the Round 2 Comprehensive Site Characterization and Data Gaps Evaluation Report and BERA.

3.0 DEVELOPMENT OF ACUTE AND CHRONIC SCREENING LEVELS FOR CHEMICAL MIXTURES AND THE USE OF SURROGATES

Some chemicals will be treated as mixtures for screening, and other chemicals will be evaluated using appropriate surrogate chemicals. The process for screening chemicals as mixtures is described in Section 3.1. Section 3.2 describes how SLs based on surrogates will be assigned.

3.1 CHEMICALS CONSIDERED AS MIXTURES

For screening purposes, some chemicals (including dioxins and dioxin-like chemicals, polychlorinated biphenyls [PCBs], chlordane, and some petroleum products) will be considered as mixtures based on a common mode of action or because available criteria are based on studies using mixtures.

3.1.1 Dioxins and Furans

Dioxin-like chemicals, including some dibenzodioxins and dibenzofurans, share a common mode of toxic action through activation of the aromatic hydrocarbon receptor (AhR). These chemicals will therefore be considered as a mixture, and their toxicity equivalence (TEQ) summed as described in van den Berg (1998) using 1998 consensus World Health Organization (WHO) toxic equivalency factors (TEFs) (Van den Berg et al. 1998). This system uses TEFs for individual compounds to relate their toxicity to 2,3,7,8 TCDD (the most potent AhR activator). For screening of surface water, groundwater, and transition zone water, the TEQ will be compared to the SL for 2,3,7,8 TCDD.

3.1.2 PCB Aroclors

Based on the hierarchy described above, SLs will be developed for the Aroclor mixtures identified as COIs (e.g., Aroclor 1248, 1245,1260, etc). State and federal criteria are available for PCBs defined as the sum of all congener or all isomer or Aroclor analyses as well (EPA 2002b). In addition to screening individual Aroclor mixtures, total PCB Aroclors also will be screened against a total PCB SL.

3.1.3 Chlordane

Technical chlordane is composed of a mixture of chlordane isomers: 24% trans(gamma)-chlordane, 19% cis(alpha)chlordane, 10% heptachlor, 21.5% chlordane isomers, 7% nonachlor, and 18.5% closely related chlorinated hydrocarbon compounds (EPA 1980). SLs will be assigned to several chlordane isomers based on existing criteria (not using ECOTOX or literature searches). Some isomers may have no associated criteria, screening levels, or guidance values. There are AWQC for chlordane based on studies using the technical mixture. Isomer constituents of chlordane will be summed as "total" chlordane. This total chlordane concentration

will be compared to an SL for chlordane. Thus, some isomers may be screened only as part of a chlordane sum and others may be screened as individual chemicals as well as part of a chlordane sum.

3.1.4 Total Petroleum Hydrocarbons

Petroleum products are often reported as mixtures (e.g. diesel, gasoline, and heavy oil). These may be summed as total petroleum hydrocarbons (TPH). ODEQ has not developed criteria to evaluate ecological risks associated with TPH[2]. If TPH is detected in an exposure medium (i.e., surface water or transition zone water) a risk-based process will be developed for TPH (or a surrogate constituent will be used).

3.2 CHEMICALS WITH SURROGATE VALUES

For several chemicals lacking existing criteria, screening levels, or guidance values, acceptable surrogate chemicals will be used for SLs. For several polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs), surrogates may be assigned. For PAHs, benzo(a)pyrene will be assigned as a protective surrogate when no other more structurally similar PAH with existing criteria can be identified., Similarly, ethylbenzene will be used as a protective surrogate for VOCs lacking existing criteria or more structurally similar surrogates. Surrogate values will also be used for some DDT isomers. Because there are existing federal or state criteria for some DDT isomers (4,4'-DDD, 4,4'-DDE, 4,4'-DDT), SLs for these isomers will be applied as conservative surrogates for isomers with no existing federal or state criteria (2,4'-DDD, 2,4'-DDE, and 2,4'-DDT respectively). Uncertainties surrounding the assignment of surrogates will be discussed in detail in the ecological risk evaluation in the Round 2 Comprehensive Site Characterization and Data Gaps Evaluation Report.

[2] Oregon's guidance on remediation of petroleum contaminated sites includes criteria to evaluate risks only from human exposure to TPH (ODEQ 2003). The guidance indicates that ODEQ may require further action where groundwater containing greater than 1 ppm TPH discharges to surface water, but it acknowledges that this is not a risk-based criterion (ODEQ 2003).

4.0 SCREENING DATA USABILITY

The primary use of the SLs developed according to the process in this memo will be as part of preliminary screening of water data to be presented in the ecological risk evaluation in the Round 2 Comprehensive Site Characterization and Data Gaps Evaluation Report. The process for SLs in this memo will insure a conservative screen is performed of the water data, but does not necessarily indicate there is ecological risk or that the SLs are appropriate remediation goals or standards. This screening will serve as one of multiple lines of evidence for determination of COPCs. For example, exceedance of an SL for a transition zone water sample might mean there will be a potential adverse effect on infaunal benthic invertebrates. This line of evidence will be weighed against results from bioassay tests using co-located sediments, measured chemical concentrations in the sediments compared to sediment guidelines, and invertebrate tissue concentrations compared to TRVs (Integral and Windward 2004; Windward 2004). The intent of values used for SLs will also be considered. AWQC are intended to be protective of 95% of species (Stephan et al. 1985) but may rely on studies of species not present or relevant for the Willamette River. If an exceedance of AWQC is noted, a search for species specific water quality values will be initiated. The location of exceedances will also be considered including the suitability of the sample collection location as habitat for potentially impacted organisms. These and other issues related to usability of screening data will be discussed in the context of screening results presented in the ecological risk evaluation in the Round 2 Comprehensive Site Characterization and Data Gaps Evaluation Report.

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EPA Comments on Process for Selecting Acute and Chronic Water Screening Levels for Portland Harbor Surface Water, Groundwater and Transition Zone Water and Associated Surface Water Screening Table
March 24, 2006

Introduction:

EPA has reviewed the Process for Selecting Acute and Chronic Water Screening Levels for Portland Harbor Surface Water, Groundwater and Transition Zone Water document (Screening Approach document) submitted on April 29, 2005 and Tables 1 and 2 which present the acute and chronic ecological screening levels and the acute and chronic amphibian water screening levels respectively. The tables were submitted in response to an EPA request to facilitate review of the April 29, 2005 document.

General Comments:

It is unclear whether acute values are necessary at the screening stage. Calculation of chronic screening levels should be sufficient to define threshold values below which adverse effects to aquatic life should not occur. In addition, the document does not discuss how acute and chronic screening values will be applied. EPA believes that chronic values should be the priority, because the majority of the exposure at this site will be chronic (longer term exposure). Acute values should be used secondarily only if no chronic value is available, with an appropriate conversion factor. It should be noted that Oregon's screening level values in guidance only contains chronic values and if an acute value was used in the absence of a chronic value, it was divided by 50 for the acute to chronic conversion (see specific comment below).

Specific Comments – Approach Memo:

Section 1.0, Introduction, 2nd Paragraph: Detection limits for non-detected chemicals should be compared to chronic screening criteria protective of aquatic life to confirm that detection limits for surface water, groundwater and transition zone water are adequate. This is particularly important for transition zone water because the data was only recently received and has not been reviewed by the project team and chemical concentrations in transition zone water have the potential to be higher than those detected in surface water.

Section 1.0, Introduction, 3rd Paragraph: The Screening Level Approach document states that one use of screening levels is as "a line of evidence for identification of contaminants of potential concern (COPCs) for fish and invertebrates in contact with surface water (fish and invertebrates) and transition zone water (invertebrates)." However, the conceptual site model for the ecological risk assessment (Figure 4) included in EPA's December 2, 2005 Identification of Round 3 Data Gaps memo identified transition zone water is a complete and significant exposure pathway for periphyton, aquatic plants, sculpin and lamprey ammocoetes. Similarly, surface water was identified as a complete and significant exposure pathway for periphyton, aquatic plants and phytoplankton. Application of surface water screening criteria must consider these exposure pathways.

Section 2.2, Sources of Screening Levels: This document concentrates on *effects based* criteria, and does not include water criteria that address bioconcentration / bioaccumulation potential. EPA expects that site specific surface water criteria for bioaccumlative chemicals will be developed through the use of the food web model. However, as stated in Section 2.3.1 of EPA's sediment guidance, "For ecological risk to wildlife or fish from food chain effects, widely accepted screening values have not yet been fully developed. As for the human health risk assessment, if bioaccumulative contaminants are found in biota at levels above site background, they generally should not be screened out and should be carried into the baseline risk assessment." As a result, screening of bioaccumlative chemicals in surface water should not be performed.

Section 2.2.4, ECOTOX Database, Page 3: The Screening Approach Document states that that searches of the ECOTOX database will be "limited to growth, mortality and reproductive effects studies on freshwater organisms." The ECOTOX literature search should be more inclusive. For example, surface water concentrations of contaminants should also be compared to concentrations identified in the literature as impacting adult or juvenile salmon and lamprey via olfactory disruption.

Section 2.2.5, Other Literature Sources, page 4. In cases where other literature sources must be consulted to develop criteria or guidelines that can be used as screening values, EPA recommends that the LWG consult a compendium of environmental quality guidelines developed by MacDonald et al. (1999) for Environment Canada. MacDonald et al. has compiled guidelines for a large number of chemicals from governments around the world, and is particularly good for chemicals where EPA, Environment Canada, and other national governmental agencies have yet to develop water quality criteria. This reference can be found on the Internet at:
http://www.pyr.ec.gc.ca/georgiabasin/reports/Environmental%20Benchmarks/GB-99-01_E.pdf

Section 2.2.5, ECOTOX Database and Other literature Sources: When consulting other literature sources to select a value for chronic effects, appropriate chronic data should be search for first on the chemical of concern, and this chronic data should be used before calculating one from an acute value.

Section 2.3.2, Chronic Screening Levels, page 5: EPA concurs with the individual sources of screening levels included in the hierarchy. However, EPA recommends the following changes to the proposed hierarchy:

1. Level 1: The **lowest** of the national recommended water quality criteria and the proposed State of Oregon water quality criteria as specified in OAR 340-41Table 33.
2. Level 2: The most protective LCV from Suter and Tsao (1996).
3. Level 3: The USEPA (2004) proposed PAH specific final chronic values for individual PAH compounds found in Table 3-4 of USEPA (2004). Use of the individual PAH guidelines from USEPA (2004) as screening levels would eliminate the need to use a screening level for benzo(a)pyrene as a surrogate for other PAH compounds.

4. Level 4: Canadian Water Quality Guidelines, which can be found at http://www.ccme.ca/assets/pdf/e1_062.pdf
5. Level 5: more protective of acute ODEQ guidance values (ODEQ 2004) or Tier II acute values for Suter and Tsao divided by a safety factor of 50. In general, if there is a reasonable surrogate for the chemical in regard to chronic effects, this should be consulted before going to acute effects.

Addition of these additional tiers in the hierarchy, combined with information in the MacDonald et al. (1999) compendium should minimize the number of chemicals for which screening levels cannot be developed.

Section 2.3.4, Selection of Amphibian-Specific Screening Levels, Page 6: It is unclear whether the chronic screening levels as developed from the hierarchy described in Specific Comment 3 would not also be protective of the tadpole or larval stage of amphibians? EPA does not object to the development of separate screening levels for amphibians, but would like to ensure they are actually needed for the PRE. If amphibian-specific criteria are pursued, chronic amphibian specific hierarchy, #2, should be to consult the literature for a *chronic SL* – not an acute.

Section 3.1.4, Total Petroleum Hydrocarbons, page 8: In our June 3, 2005 comments on the Groundwater Pathway Assessment Sampling and Analysis Plan, EPA provided guidance on the development of screening criteria for Total Petroleum Hydrocarbons (TPH) based on criteria developed for use at military sites in the states of Alaska and Washington EPA recommended the use of water values developed for diesel range and gasoline fractions. A water value is not available for the residual fraction. For gasoline range hydrocarbons (C_6 - C_{10}), EPA recommended a screening criteria of 114 ug/l. This value should be included in Table 1. For diesel range hydrocarbons (C_{10} – C_{25}) EPA recommended a screening criteria of 0.014 ug/l. Further discussion between EPA and the LWG is required regarding application of this value. However it should be noted that the concentration of 0.014 ug/l is in the range of the expected solubility of a C_{17} hydrocarbon (mid-point between C_{10} and C_{25}) and that the presence of sheen in Oregon waters violates Oregon narrative water quality.

Section 4.0, Screening Data Usability: The text states that if there is an exceedance of a water SL, this line of evidence will be "weighed against results from bioassay tests using co-located sediments, measured chemical concentrations in the sediments compared to sediment guidelines, and invertebrate tissue concentrations compared to TRVs." The sediment bioassays should be considered a separate line of evidence of invertebrate exposure in that the duration and conduction of the sediment bioassays may not adequately reflect risk from water exposure in the environment. The LWG has proposed a line of evidence approach in its March 15, Proposed Ecological Risk Assessment Decision Framework. Further discussion between EPA and the LWG is required to determine the appropriate line of evidence/weight of evidence approach for the Portland Harbor Site. In addition, the application of water screening criteria should consider the exposure pathways as identified in the conceptual site model for the ecological risk assessment (Figure 4) included in EPA's December 2, 2005 Identification of Round 3 Data Gaps memo.

It should be noted that many of the criteria identified in Table 1 are chronic AWQC that are considered potential ARARs for the Portland Harbor site. As a result, exceedances of AWQC may require specific cleanup or source control activities to ensure that AWQC are met throughout the Portland Harbor site.

Specific Comments – Screening Levels

Table 1 – PAHs: Consistent with the comment above, PAH criteria should be taken from the Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: PAH Mixtures (EPA 2004).

Table 1 – Total PCBs: The chronic value for total PCBs should be 0.014 ug/l. This value is based on DEQ's 2004 chronic AWQC.

Table 1 – 4,4'-DDT: The chronic value for 4,4'-DDT should be 0.001 ug/l. This value is based on DEQ's 2004 chronic AWQC and is significantly higher than the Tier II value presented.

Table 1- Chlordane: The chronic value for Chlordane should be 0.0043 ug/l. This value is based on DEQ's 2004 chronic AWQC and is significantly higher than the Tier II value presented. This value should be used for trans-chlordane, cis-chlordane and total chlordane.

Table 1 – Heptachlor: The chronic value for Heptachlor should be 0.0038 ug/l. This value is consistent with both the EPA's National Recommended Water Quality Criteria and DEQ's 2004 chronic AWQC. This value should be used for both Heptachlor and Heptachlor Epoxide.

Table 1 – Phthalates: Consistent with the Portland Harbor Joint Source Control Strategy, all phthalates should be screened against the Tier II value for bis(2-ethylhexyl)phthalate of 3 ug/l.

Table 1 – p-Xylene: Consistent with the Portland Harbor Joint Source Control Strategy, the Tier II screening value of 1.8 ug/l for m-xylene should be applied to p-xylene.

References:

MacDonald, D.D., T. Berger, K. Wood, J. Brown, T. Johnsen, M.L. Haynes, T. Brydges, M.J. MacDonald, S.L. Smith and D.P. Shaw. 1999. A Compendium of Environmental Quality Benchmarks. Georgia Basin Ecosystem Initiative Report GBEI 99-01, Environment Canada, Vancouver, BC.

USEPA. 2004. Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: PAH Mixtures. EPA-600-R-02-013, Office of Research and Development, Washington, D.C.